Thesis presented for the Degree of M.D.

by John Norman Mc Turk

M.B., Ch.B.

GASTRIC CASES IN A SURGICAL CLINIC.

consequently in each case the stomach was inspected through a laparotomy wound, and my descriptions of the lesions are based entirely upon the evidence gained by naked eye examination of the peritoneal surface of the stomach and adjacent organs, except where otherwise stated. The inspection, and the interpretations of the evidence was done by the Surgeon in whose clinic the cases appeared, which is the best possible guarantee of their accuracy. Other points with regard to the series are (a) that the appearances described are ante mortem and therefore of more interest and importance than the post-mortem findings which are more commonly reported. (b) that the organs were those of patients whose general condition was good enough to allow of the performance of a major surgical operation.

In all except the acute cases (i.e. perforated gastric ulcer and urgent gastric haemorrhage) the history of the ailments was taken direct from the patient. With the same exceptions, the preliminaries to the operation were as follows:- the patient was given a half ounce of Mag. Sulph. about 12 hours before operation and an Enema about 8 hours later: about 2 hours before the operation he was given a "test meal", no food having been given for 12 hours previously. The test meal consisted of a cup of weak tea, with one round of dry toast, and was withdrawn with the stomach tube an hour later to be examined for the presence of free Hydrochloric Acid.

Before the stomach tube was withdrawn it was used to give the routine gastric lavage - this was done with ~~the~~ diluted Condy's fluid, and was persisted with until the fluid returned without any solid particles in suspension, and with a slight tinge of its proper colour. This will be referred to again in the consideration of the bacteriological observations. - An hour after the cleansing of the stomach, the patient was taken into the operating theatre. The operation was done in each case by the same Surgeon, and each patient was anaesthetised with chloroform: the incision was invariably a mesial one extending from the umbilicus upwards so that in all the cases, the conditions of observation were much the same.

With reference to the examination of the gastric contents for free hydrochloric acid, it should be explained that this investigation was not carried out in all the cases; but was done often enough to give data which may be of some service. In many of the cases the examination was made on several days preceeding the operation as well as in the routine manner above mentioned. The test employed was invariably that described by Günsberg in which an alcoholic solution of phloroglucin 6·6% and vanillin 3·3% is used. The actual amount of free hydrochloric acid was not estimated, but a rough comparative scale was arrived at by the uniform application of the same test.

The bacteriological methods should also be detailed. In every case the observations were made by practised and skilful bacteriologists from agar media inoculated by the surgeon during the operation. The majority of the inoculations were from the stomach and the jejunum opened in the course of a gastro-jejunostomy, and in these cases the inoculation was made as soon as these organs were opened, by stroking a sterile platinum loop over the mucous surface and then transferring the fluid so obtained on to the agar slope. A few cultures were taken from the peritoneal cavity and this was done by taking some of the peritoneal fluid on a platinum loop and inoculating the agar medium as soon as the peritoneum was opened. The inoculated tubes were then incubated at once and were examined by the bacteriologist.
It should be pointed out that this method makes no distinction between the aerobic and the non-aerobic organisms; and obviously in those cases where no growth was obtained on the media, we cannot affirm that the mucosa is sterile, but only that there were not many organisms capable of growing under the conditions supplied to them.

The cases I have to refer to will be grouped under the following headings:-

A. Carcinomatous. (50 cases.)

B. Simple. (108 cases.)

C. Perforated Ulcers. (30 cases.)

& D. finally, some reference will be made to the bacteriology of the gastric and jejunal contents in these cases.

A. The Carcinomatous Cases.

Of these cases I have 50 to which I wish to make short reference, and I would again emphasise the fact that the diagnosis of malignancy or non-malignancy was made by a great surgeon who is in constant touch with gastric diagnosis: in some cases, indeed, the diagnosis was confirmed on microscopical examination, but this could not be employed in the majority of cases. In the last paragraphs of these notes I shall refer to 15 of these cases in which media were inoculated from the gastric and jejunal contents. Perhaps the clearest idea of these cases will be gained from the fact that 15 of the patients were subjected to the operation of pylorectomy or gastro-pylorectomy; 27 to that of gastro jujenostomy, and only 8 were sent from the theatre without any palliative measures being attempted. These figures indicate how different was the condition of the organs from that usually seen at the autopsy of a malignant gastric case. They also indicate, I venture to think, that the medical profession as a whole is indeed being influenced by the plea of the surgeons for earlier surgical interference in those abdominal cases where malignancy is suspected.

The first point to which I would draw attention is the length of time during which the patients had suffered from pain, or vomiting, or both. First, it should be mentioned as an undoubted fact that malignant disease does often supervene upon gastric disorder of a less dangerous nature, and that in some cases the history can give the medical man no idea of the period at which this change has taken place. On the other hand, there are many cases in which there can be little doubt as to the period at which malignancy supervened - a good instance occurs in this series in the case of a man aged 66, who had suffered from both pain and vomiting ever since he could remember, but in whom both these symptoms had been very much more pronounced for nine months previous to his admission - laparotomy demonstrated a large cancerous growth involving the stomach, the transverse colon and the spleen.

But the former class of patients makes it quite impossible to state with accuracy how long the malignant disease had existed on the average: taking the cases as a whole, one may say that 9 months is about the average duration of the disease up to the time of operation.

With regard to the onset. In only 27 of the cases have I definite information as to the suddenness (or otherwise) and I find that 20 of the patients described the onset as gradual, while 7 spoke of it as sudden.

In 32 (64%) of the cases, both pain and vomiting began about the same time. In 17 (34%) of the cases the pain began before the vomiting, the average difference between the times of onset being 12 months: while in only one case did vomiting precede the pain – in this case the vomiting had persisted for 4 months and the pain for one month. It will be noted that those cases in which the pain preceded the vomiting wasted more time between the onset of the two symptoms than the average of the whole series delayed after the onset, and before admission. From this one seems entitled to argue that it is the vomiting and not the pain that sends patients to seek surgical aid. The mode of onset in these cases is of interest as showing most marked contrast to those recorded by Osler and Macrae, who found that in 150 cases, pain was the first symptom in 48 (32%), and vomiting the first in no less than 21 (14%).

	Total cases.	Vomit first.	Pain first.
My cases	50	1 = 2%	32 = 64%
Osler and Macrae	150	21 = 14%	48 = 32%

It is interesting to note that 5 patients had noticed "lumps" in the gastric region; and that two of these patients noticed the tumours as soon as any other symptom. It is of some significance that not one of these 5 patients came to the surgeon until 2 months had elapsed.

Two of the patients came complaining of dysphagia, and in both these cases the disease was far advanced: in the one case there was a tumour in the central portion of the stomach, involving the transverse colon and with secondary deposits in the liver: in the other case there was a diffuse involvement of the body of the stomach. From these two cases one would conclude that this symptom should be a warning to the surgeon to hold his hand if he has made a diagnosis of gastric carcinoma.

Mayo Robson and Osler and Macrae almost agree as to the percentage of cases which vomit, the former giving 85% and the latter 86·6% while Warren Lyman of Montreal gives 68·2 as the percentage. In the series before me, not a single patient appeared who had escaped vomiting, and in only one case could the vomiting be considered a trivial feature: similarly there was one case (2%) in which pain did not figure, as contrasted with 13·4% of Osler and Macrae's.

While considering the histories of these patients we may well notice the incidence of haemorrhage among them. Mayo Robson states that 50% of his cases vomit blood at some period of the disease: Macrae and Osler found this occurring in only 23·1% of their cases. In the present series of cases, only 12 patients (24%) had noticed blood in the vomit; 6 described it as "red", and 6 as "like coffee grounds".

Melaena occurred in only 5 cases (10%) and in four of these it was associated with vomiting of red blood. All these figures quoted above are useful from the point of view of diagnosis, and also from that of pathology as the view is almost universal that obvious haemorrhage in these cases indicates ulceration of the growth through the mucous membrane. But in another respect they seem to be misleading since Martin of Montreal has found chemical evidence of blood in the faeces of 90% of his gastric cancers - an investigation which seems to prove that minute haemorrhage from the stomach are common in these cases, and which may offer an explanation for the rapid emaciation and anaemia of these patients.

	This Series	F. Müller.
Constipation.	32 = 71·1%	
Normal.	10 = 22·2%	
Diarrhoea.	3 = 6·6%	35%

In 5 of my cases, I have no reference to the patients' statements as to the actions of the bowels. Of the remaining 45 patients, 32 (71·1%) gave very definite histories of constipation; 3 (6.6%) had suffered from diarrhoea and 10 (22·2%) had enjoyed a natural condition of the bowels. This proportion is in marked contrast to that enunciated by F. Müller, who found diarrhoea present in 35% of his cases.

I am afraid that this subject is never likely to throw much light on the diagnosis of a case, as (a) constipation is so appallingly common and (b) its onset can be attributed in these cases to the alteration in diet which has almost always been made.

The sex incidences of the condition is of interest: it has been stated as follows:-

By Perry and Shaw, 204 males to 79 females.

By Welch , 5 " to 4 "

on a series of post mortem records extending over more than 1000 cases. In the 50 cases I am referring to, the proportion is 30 males to 20 females.

	Males.	Females.
These cases	30	20
Welch.	5	4
Perry and Shaw.	204	79

The age incidence is of much greater importance, as this is a factor in the diagnosis which must not be ignored. The youngest patient in the series was 29 years of age, the oldest 66: and no less than 19 patients were under 45 years of age: this forms a serious caution against the hasty exclusion of malignant disease on the ground of a patient's being comparatively young. The average age of the patients was 48·8 years, an age usually reckoned as falling within the limits of middle life.

It would perhaps be unfair to press this point too far, since there is no doubt that many cases are not submitted to the surgeon simply because of their age: but nevertheless it is of prime importance to recognise how large a number of patients develop cancer of the stomach at a comparatively early age. Dr. Martin of Montreal found that the average age in males was 59·7 years, and in females 53·7: the series before me gives the figures 50·1 for males and 47 years for females – a slight difference between the sexes that is of no practical moment.

In considering my next point, I shall have to refer to some simple cases as well as malignant ones: but I think the present the most suitable moment for its consideration as it is a question of diagnosis between the simple and the malignant. I have detailed previously the method of examination for free Hydrochloric Acid and I wish now to tabulate the results in the 113 cases, where they have been noted. Of these 113, 40 are malignant cases, and free Hydrochloric Acid was found in 8 or 20%, but it must be noted that the test showed approximately normal amount of the acid in only 2 cases or 5%. On the other hand, of the 73 innocent cases free Hydrochloric Acid was found in 55 of these cases (i.e.75·3%).

	HCl.present.	HCl.normal amount.	HCl.absent.	% of error.
Innocent.	62=84·9%	55=75·3%	11=15·1%	15·1%
Malignant.	8=20·%	2= 5·%	32=80%	5 %

In the above table I have endeavoured to show the percentage of error obtained in the use of this test, for that is the true standard for judgement. But my percentage scarcely does justice to the test, because in many of the cases, only one examination of the stomach-contents was made. For practical purposes, though, I venture to think that my figures are the more valuable from the simplicity of the method employed - because any medical man can examine the stomach contents once, but it is in only exceptional cases that repeated examination is possible. It will be noticed at once that the test when applied to malignant cases is considerably more accurate than when when applied to innocent cases: i.e. that it would tend to make one diagnose carcinoma oftener than one should. Even this is no great disadvantage as the diagnosis will be cleared up at the operation: but it would be very much more serious if it made one pass over many malignant cases as simple. That the repetition of the test may considerably improve its accuracy is shown by the fact that there were 89.7% of cases with entire absence of Hydrochloric Acid among the 343 cases published by Osler, Boas, Sneider and Rosenheim. I should like again to emphasise the fact that the series under consideration were for the most part early cases capable of operative treatment: and I think that the medical man should welcome with relief a test whose single application will put him on his guard in 95% of cases where he has to deal with gastric carcinoma

– for a reduction in the amount of free acid must always be regarded as most suspicious. And yet, this is a test that but very few general practitioners ever practice, though it is now 30 years since Vonder Velder first announced it.

To consider now some of the pathological points presented by these cases:j

First, to take up the cancerous infections following on the primary growths: these are for the most part in lymphatic glands. But 5 of the cases revealed secondary nodules on the surface of the liver, and no one of course can state what number may have had secondary concealed nodules in the liver. It is to be regretted that in only 15 of the 50 cases, was any glandular tissue submitted to the pathologist; but even this number may suggest some important points. The glands removed for this purpose were naturally those most enlarged and those considered most suspicious. In no less than 5 or (33%) the pathologists reported no evidence of malignant infection – this is a fact of the very utmost importance and must always remain the basis of all radical curative operations for gastric cancer. Along with these 5 cases may be grouped 7 others in which no enlarged glands were discovered. It is, of course, a standard truth that glandular infection in these cases is of late occurence, and I think that this series

of cases goes far to support the doctrine, for out of 50 cases advanced enough to be diagnosed and submitted to operation, we find 24% with no discoverable infection of lymphatic glands, and we may fairly conclude that some of enlarged glands observed by the surgeon, but not examined by the pathologist were non-malignant and that the figure is really considerably higher than 24%

It is of importance to note which were the glands infected:- and first it is to be noted that the glands and general peritoneum were both affected in 4 cases - these being as obviously hopeless as the cases with secondary deposits in the liver. In 10 more cases, the glands along both curvatures of the stomach were enlarged; in only 4 cases was there enlargement of the glands on the greater curvature alone, while in 25 cases those on the lesser curvature were alone involved. Thus in 58·1% of the cases showing enlarged glands, these were found only on the lesser curvature. It is worth recording that among the 4 cases where glands were enlarged only along the greater curvature, only one case was a purely pyloric cancer: and this will be shown to be small in proportion to the number of pyloric cases.

This series did not convince one of the truth of Mayo's statement regarding the importance of that gland situated just below the pylorus, but it should be confessed that no particular search was made for this gland.

To consider now the site of the malignant growth in these cases. It is almost impossible to classify accurately lesions which show so many combinations and such fine gradations. Perhaps the best way to group the cases is under the following heads:-

(a) Cases where the growth is pyloric with little or no extension along the stomach wall. I find 12 cases fall under this heading. (24%).

(b) Cases where the main lesion appears to be pyloric, but with important extensions - these make up 20 cases (40%) and may be subdivided again as follows:-

I Where the extension is along the lesser curvature of the stomach:- 13 cases.

II Where the extension is along the greater curvature:- 2 cases.

III Where the extension is a general invasion of the pyloric autrum:- 3 cases.

IV Where the extension is posterior, involving the pancreas:- 2 cases.

(c) Cases where the pyloric autrum is the site of the lesion. It is conspicuous that in all these cases, the greater part of the growth is on the lesser curvature. The series presents 5 such cases. (10%).

(d) Cases where the tumour appears on the body of the organ. These are only 9 cases (18%), though this is much the largest area of tissue for the disease to attack.

(e) Cases where the tumour appears at the Cardiac end of the stomach. These are only 2 in number (4%).

(f) Cases where the lesion is a widespread cancerous infiltration of the gastric wall. These are rapid cases, presenting no prospects of satisfactory treatment, being obviously unsuited for either radical removal or gastro-jujenostomy. There are 2 of these cases in this series, (4%).

It strikes one at once that the pylorus is the site most affected in this group of cases, no fewer than 64% of the tumours involving it. Other things being equal, one would expect the pyloric cases to come before the surgeon sooner than any other cases: for one would expect pain and vomiting to be earlier in onset and more definite in character. But it must be remembered that the pylorus is not invariably the first place affected even in the cases where it is involved: in fact, Israel and Hausemaun state that pyloric cancer is always an extension from cancer on the lesser curvature, while Mikulicz and Kausch state that the lesser curvature is first affected in 40% of gastric cancers. This last statement is scarcely borne out by the present series of cases. Since only 24 cases (48%) showed involvement of the lesser curvature, and is scarcely credible that this was the starting-point in every case. And the fact remains that there were 12 cases in which the naked eye could trace no possibility of

the growths' having spread from the lesser curvature on to the pylorieus.

The proportion of cases showing involvement of the lesser curvature is variously given as 26·4% (Boas) as 30% (Tabora) and as 9.8% (Furnival): while, as I have said, 48% of the present series showed involvement of th this area.

In Furnival's large collection of 1796 cases, he found the pylorus affected in 61·2%, as against the 61% of Welch, the 64% I have mentioned in this series, and the 26·4% of Boas: he found in 10·9% that the cardiac orifice was affected, while only 4% of this series show the disease in the cardiac area.

I shall have cause to refer to these malignant cases once more in recording the bacteriological facts observed in connection with them.

II Simple Cases. (108 cases).

This large group of cases must be subdivided as follows:-

I Cases presenting definite Pyloric Stenosis, with or without much gastric dilatation. (45 cases).

II Cases presenting much dilatation of the stomach without any definite pyloric obstruction. (8 cases.)

III Cases where the chief abnormality was the presence of inflammatory adhesions around the stomach or pylorus. (11 cases).

IV Cases where the chief abnormality was the presence of a scar on the surface of the pylorus or stomach. (31 cases).

V Cases where there was evidence of the socalled hour-glass contraction of the stomach. (5 cases).

VI Cases where no lesion of the stomach or pylorus was discovered. (8 cases).

Before considering these cases as sub-divided above, it is worth glancing at them as a whole. The most striking feature is the causation - for we must recognise that the stenoses, the cicatrices and the adhesions are all due to inflammatory causes; and I shall show that the hour-glass contractions give proof of a similar origin. In all, these constitute 92 or 85·2% of the simple cases, and 60·1% of all cases except the acute (which also are of inflammatory origin, of course). I have subdivided these cases not so much with the idea of their distinctions, as with a view to showing some of their analogies.

I Pyloric Stenosis. (45 cases).

It will be noticed that these cases presented themselves with exactly the same frequency as did the Gastric Cancers.

It may be taken that all these cases are of inflammatory origin, as none but cases of organic contraction are included among them – and, indeed, many of the lesions bear quite unmistakable evidence of their causation, as I hope to show, for this group includes many cases presenting adhesions or actual scars on the pylorus. Two of the cases are especially interesting from their causation:–

One, a man who had been operated upon in London for a perforated duodenal ulcer :– eighteen months afterwards his pylorus was narrowed by the cicatricial contraction which had followed on the healing of the perforation: there were numerous adhesions round the scar, but they were not very dense: the stomach showed no dilatation.

The other, a man who had swallowed an ounce and a half of Spirits of Salts two months previously: at that time he had vomited portions of his gastric mucosa, and altered blood: he made no complaint of dysphagia, but came complaining of pain and repeated vomiting. I think this is an unusual sequel to the taking of a strong corrosive acid. The operation revealed marked stenosis of his pylorus – again, without any dilatation of the stomach.

The causation of these cases is pretty securely established by the fact that only 11 patients (23·3%) had failed to observe haemorrhage of some sort. All the other patients gave spontaneous histories of melaena or the vomiting of blood: 24 had vomited dark blood like "coffee grounds"; 8 had vomited red blood and 6 had noticed melaena.

No haemorrhage noticed.	11	23·3%
Vomited altered blood.	24	56%
Vomited red blood.	8	13·6%
Noticed melaena.	6	14%

This table affords extremely good reason to suppose that pyloric ulceration was the cause of the lesion in all, or almost all the cases: for not all the patients could be expected to remember the melaena or the vomiting of blood over the long period of the histories they gave: and an endeavour was always made to obtain as spontaneous a history as possible. Moreover, in all the eleven cases which gave no history of haemorrhage, some definite sign of old inflammation was found on the pylorus: 7 showed scarring on the surface, and 8 showed definite adhesions round the pylorus. We have thus an inflammatory origin for every one of these cases.

The absence of dilatation of the stomach should not preclude a diagnosis of pyloric stenosis, for it is quite

obvious that the dilatation must be a secondary event, just as in the case of similar lesions in the heart. The gastric spasm causing pain and vomiting are identically the same whether there is dilatation or not: the only absolute distinction is obtained by observing how much liquid can be passed into the stomach through the stomach-tube without discomfort to the patient. Other diagnostic signs are of course obtained by defining the lower gastric border by the various methods employed; but the amount of dilatation will very often be much over-estimated by these methods, as it is often found that both borders of the stomach are lower than usual, the whole organ being displaced downwards. Of the 45 cases of pyloric stenosis furnished by the series, I find that marked dilatation was present in only 24 (or 56%). I have grouped under this heading all cases where pyloric stenosis was observed, whether adhesions, scars, or dilatation were present or not, because it is upon the stenosis that the more important symptoms depend in these cases.

Sex.

It is extraordinary to find that no less than 36 of the patients were males, only 9 (20%) being females, though it is acknowledged that women are much less prone to chronic ulceration of the stomach than men are, and this is much the favourite site for the chronic ulcer.

The ages of the patients varied from 13 years to 66 years, 27 being under 40 years, and 9 over 50 years: from this it will be seen that no less than 40% of these patients are over 40 years of age, and this alone will give an idea of the difficulty and responsibility attaching to the differentiation of the simple from the malignant pyloric cases.

Age.

But this series also gives good illustration of the assistance to be gained from the test for free hydrochloric acid. It was used in 34 of these cases, and was misleading in only 3, or (6·6%).

It is most remarkable to note the length of time for which many of these patients had suffered - and in many cases their sufferings had been enough to make life utterly miserable. Perhaps some explanation of this may be found in the fact that surgical relief for these unfortunates is comparatively new, and consequently one may hope to see them in the surgical clinics at a much earlier date in future. Only 17 patients had suffered for less than 3 years and the average duration of the symptoms was 5·5 years, which is a great tribute to the patience and endurance of the patients. A very large number of the patients had received treatment in the medical wards of the same great hospital at some time of their sufferings, and many were sent direct to the surgical

listory.

from the medical wards - in all 29 (or 64·4%) patients had been treated by the physicians of the hospital. This is a most effectual guarantee that these cases were not submitted to operation until all medicalremedies had been tried without success: and it suggests that the physicians of the hospital are more ready to call in surgical aid than is the general practitioner.

In 30 (66·6%) of these cases there is a very definite history of long-standing constipation: in only 2 cases was a negative history given on this point: while in the remaining 13 cases, there is no definite information.

Pyloric Scars.

In these cases, I find that a definite scar was present on the pylorus in 22 cases (or 48·8%), while in 4 cases the whole circumference of the pylorus was indurated. As might be expected, the majority of the cicatrices described were on the anterior surface of the pylorus and it is impossible that all those on the posterior surface were discovered.

Adhesions around the pylorus were found on 15 occasions (33·3%): and enlarged glands were found in the vicinity of the pylorus in 7 cases, (15·5%) these glands showing chronic inflammatory changes whenever they were examined microscopically. A difficulty must always confront the surgeon when he finds "a mass" about the

pylorus: he must decide at once on the innocence or malignancy of the condition: among these 45 cases are 12 (26.6%) which presented this difficulty; while in 3 of these an additional difficulty lay in the presence of enlarged glands.

II Dilatation of the Stomach. (8 cases).

Under this heading are included only those cases where dilatation was found without any organic stenosis of the pylorus – It is extremely probable that some of these cases were of the nature of pyloric spasmodic stenosis, as two patients gave a history of vomiting altered blood. But in two cases at least the dilatation was of the acute form; one of these patients was a congenital idiot of 13 years of age. The remaining cases appear to have been cases of atonic dilatation.

The Hydrochloric acid test was misleading, in one out of the four cases in which it was used – this being an atonic case.

In no case were any enlarged glands, adhesions or cicatrices found.

Six of the 8 patients were under 40 years of age: the average age being 29·75 years: the sexes suffered equally.

III Adhesions. (11 cases).

The cases referred to are those in which only adhesions were found on examining the stomach. As noted under the other headings, additional cases showed the presence of adhesions as well as other more definite lesions.

The sexes are affected here in almost equal numbers - 6 patients were males and 5 females. It is difficult to see why the proportions should be so different from those obtaining in other forms of chronic affections, unless it be that these cases are due to inflammation without any ulceration: this explanation seems improbable as only two patients failed to tell of haemorrhage at some time in their illness.

The ages of the patients were greater than in the other forms of simple affection, the average being 41.6 years.

The striking feature of the course pursued by these cases is that while vomiting occurred almost universally, it was much less frequent than in the other types of lesion. I have already recorded that 9 of these 11 patients noticed haemorrhage - and all these 9 vomited the blood (altered blood in 7 cases); but it was pain and not vomiting that made them seek relief at the surgeon's hands.

Constipation is also much less marked in this

section, only 5 patients being affected (45·4%). The duration of the symptoms was, on the average, 6·4 years.

The Hydrochloric Acid test was more accurate than in the Dilatation cases: it gave a positive result in 6 cases and negative in 1. This one case requires special mention: the patient was a man of 29 years, and had been suffering from pain and vomiting for a year – the pain coming on immediately after food: there was no haematemesis or malaena: at the operation numerous adhesions were found round the pylorus, but the feature of the case was the condition of the stomach, which was smaller than normal, and covered with dilated veins – it was presumed to be a naevoid condition of the gastric wall.

In two cases the adhesions were on the first part of the duodenum; in 6 were on the pylorus itself; in 1 were on the anterior gastric wall, and in 1 were on the lesser curvature. Enlarged glands were found in 4 cases, and in each case proved to be inflammatory on microscopical examination.

IV Cicatrices. (31 cases).

These are cases in which a definite scar was observed on the peritoneal aspect of the stomach or pylorus, but in which there was no organic pyloric stenosis. Their inflammatory origin may be assumed in each case.

The sexes were affected less unequally than in the other simple cases, except the adhesions group. This is probably to be explained on the ground that some at least of these cicatrices were caused by acute ulcers and not by chronic. Males were affected in 17 cases (54·8%) and females in 14 cases.

The ages varied from 22 to 61 years, the average being 39·1 years.

The duration of the symptoms was almost always considerable - the average time being 5·9 years.

Only 8 patients (25.8%) failed to notice bleeding at some time of their illness. In 10 cases melaena was noticed, while 13 vomited "coffee-ground material" and 9 vomited red blood. 61% of the patients had been treated in the medical wards of the hospital.

Constipation was almost universal - 95·9% of the patients had suffered from it. The Hydrochloric Acid test was misleading in 2 out of the 20 cases in which it was employed, an error of 10%.

Enlarged glands were found in only 2 cases, and

microscopical examination proved the enlargement to be inflammatory in both of these. Adhesions were present in 9 of these cases: and the stomach was found to be dilated in 9 other cases, though no mechanical cause for the dilatation could be found. There was an inflammatory mass in 5 cases.

The site of the cicatrix was Pyloric in 24 cases in all (or 77·4%): the particular part of the pylorus affected is ascertainable in only 13 of these cases - of these, the scar was superior in 7, anterior in 5, and inferior in 1. The remaining scars were disposed about the body of the stomach as follows:- on the Anterior surface in 2 cases: on the lesser curvature in 5: and on the greater curvature in 1 case.

V Hour-glass Contractions. (5 cases).

All the patients were women, which in itself would suggest that acute ulceration is a prominent factor in the causation of this condition.

The average age was 33·6 years, the oldest patient being 38.

The duration of the symptoms was long – the average being 7·4 years: the inference is that the contraction is a gradual process not causing very severe symptoms until it is fairly advanced.

Only one patient had failed to notice the signs of haemorrhage. The remaining 4 had all vomited red blood at some time. The patient who had not noticed any haematemesis had adhesions round the contraction.

The causation of this condition has given rise to considerable difference of opinion:- Fenwick failed to find any cause in 45% cases and states that these cases are all congenital: Moynihan is of opinion that all these contractions are acquired; together with Robson, he report-ed 48 cases, in 41 of which gastric ulceration was the cause. I think that 4 of these 5 cases were certainly caused by ulceration, and that the adhesions found in the remaining case make it extremely probable that there had been an ulcer at the beginning of the disease.

The Hydrochloric Acid test was used only twice, and gave a positive result both times.

Adhesions were present in all the cases.

VI No lesion found. (8 cases).

It would not be fair to conclude that there was no organic lesion present in any of these cases, for it is a fact that gastric ulcer may exist without any signs on the peritoneal coat; and any surgeon may occasionally overlook a lesion in these cases. But in spite of this, it is true that the Surgeon must expect to meet these disappointing cases in the course of his operative work, no matter how careful his examination and diagnosis may be. In many cases, it is the physician's duty to protect the Surgeon from this disappointment; - an instance of this occurs in this series, where a noted physician asked the surgeon to operate - the case was one of pernicious anaemia, in which the diagnosis should have been established in the medical wards. It is an acknowledged fact that no free Hydrochloric Acid is present in these cases, and this case was no exception. Three other patients had passed through the medical wards and been recommended to the surgeon for operation.

3 females and 5 males were explored without result. The ages varied from 18 to 56, the average being 37·5 years.

A history of coffee ground vomiting was given by 2 patients.

In addition to the case already mentioned, the Hydrochloric Acid test was tried in 5 cases, with a

negative result in 2 cases: this gives 40% a very high percentage of error for these cases.

	Cases.	Average Age.	% Males.	Years Average Duration.	% in Medical Wards.	% Constipation.	Error of HCl. test.	% Haemorrhage.	% Glands.	% Dilated Stomach.	% Adhesions.	% Scars.	Inflamm Mass
I Stenosis.	45	39·9	80	5·5	64·6	93·7	6·6	76·6	15·5	56	33·3	48·8	26·6
II Dilations.	8	29·75	50	2·5	35	100	25	25	-	100	-	-	-
III Adhesions.	11	41·6	54·5	6·4	36·3	71·4	14·2	81·8	36·3		100	-	27·2
IV Scars.	31	39·1	54·8	5·9	61·	95·9	10·	74·2	6·4	29·	29·	100	16·1
V Hour-glass.	5	33·6	0	7·4	60	75·	0	80·	20·	-	100	20	-
VI No Lesion.	8	37·5	62·5	4·	50	100	40	25	-	-	-	-	-
Total.	108	38·6	62·9	5·5	57·4	91·8	12·5	65·7	12·9	12·9	36·1	53·7	18·5
Cancer Cases.	45	48·8	60	?		71·1	5	24					

In the preceding table I have endeavoured to put concisely data for the comparison of the various non-malignant lesions with each other and with the malignant ones.

I think the column relating to treatment in the medical wards of the hospital is of no small importance for three reasons - (1) It shows that operation was not undertaken without due consideration and (2) without a very good trial of medical treatment (3) it is a noteworthy comment on the results to be expected from medical treatment. I cannot give any idea of the cases successfully treated by such means, but Bulstrode states that at the London Hospital 88% of gastric ulcers were discharged from the medical wards as cured or improved, but that no less than 40% of these required readmission.

I think that as the surgical results become better known, these patients will come with shorter and shorter histories of pain and vomiting. It seems very pitiable that five and a half years should be occupied by these distressing symptoms which are enough to abolish the pleasure of life.

With regard to these cases, I have not attempted to record the treatment or its results: suffice it to say that posterior gastro-jujenostomy was performed in the majority of cases, and that the immediate results which I was lucky enough to see were almost miraculous.
A great deal of adverse criticism has been expressed

against this operation on the ground of evil later results: I am extremely sorry I am not in a position to give any data on this point: but I have a very strong impression that the evil results are very much over-stated: and I am happy to state that I frequently hear of patients quoted in this series to whom the operation has proved an inestimable boon.

III. Perforated Gastric Ulcer Cases. (30 cases).

In relating some points presented by these cases, it will be well to follow the order in which these points present themselves in any individual case - thus, history, diagnosis, prognosis and morbid anatomy may be taken as our order.

Sex. First it is proper to remark that 20 of the 30 patients were females, and 10 males; a greater disparity between the sexes than that usually given.

Age. The patients varied in age from 12¾ years to 71 years; the average age was 34·2 years: the average age of male cases was 40·4 years, of the females 31·5 years - again, a great disparity between the sexes. In all, 12 patients (40%) were under 30 years of age.

revious istory. With regard to the "previous history" given by the patients:- no less than 25 patients stated they had suffered pain for over a year before the perforation occurred: and 16 gave a history of vomiting - 7 had vomited coffee ground material, and 1 red blood. Only 2 out of the 30 had suffered slight pain for only two or three weeks. The uniformity with which all these patients gave histories of more or less severe gastric disturbance is most marked, and falls into line with the commonly accepted views on the point.

Each patient gave the same history of the actual onset of sudden and severe pain. In only 16 of the cases can I find whether the patient vomited after the acute onset (which may be taken as the moment of perforation - and I find that 3 did not vomit at all; that 13 did vomit, and of these 2 vomited blood. From these cases, one can draw few conclusions as to the frequency of vomiting after perforation occurs: Miles found it in 12 out of 36 cases or 33%; Finney states that this vomiting occurs in 40% cases, and Fenwick gives the percentage as 29, and in the present series it occurred at the very least 13 times out of 30 cases or 43·3%, and may have occurred much oftener. The occasional vomiting of blood after perforation requires to be kept in mind, as it might conceivably lead to a mistake in diagnosis.

The other point I wish to mention and which bears strongly on the diagnosis is the diminution of the liver-dulness: it is illustrated by 26 of these cases:- In 14 of the cases, no dulness was discovered on percussing the liver from in front: in 6 cases the dulness was much diminished, and slightly diminished in 1 more: in only 3 cases was the dulness found normal. That is to say that in 88·5% of these cases the liver dulness gave one a very strong indication that some hollow viscus had perforated; and the previous history of gastric disorder in 93.3% gave one a very good idea of which viscus was most likely to have ruptured. (Robson and Moynihan state

that this previous history is obtained in 80%).
English quotes a series of 41 cases, in 20 of which the liver-dulness was decreased, in 12 absent, and in 11 normal: in this series the indication was present in 77·9 of the cases, since one must regard the diminution of the dulness as being equally important with its absence.

In considering the prognosis, we may first dispose of the question of age and sex - which we have shown to be more or less inter-dependent. These cases show a mortality among males of 40% (4 cases) and among females of 35% (7 cases). It will be remembered that the average age of the male patients was greater than that of the females in the proportion of 40·4 to 31·5, which is almost the identical proportion between the fatalities. The average age of the patients who recovered was 30.1 years, while the average age of those who died was 41·27 years.

The age and sex incidence and the corresponding mortality will be best shown by means of a table:-

Age.		Cases.	Died.	Recovered.	Mortality.	
Under 20 yrs.	F	–	–	–	–	
	M	1	0	1	0%	
21 – 30 "	F	10	2	8	20%	15.3%
	M	2	0	2	0%	
31 – 40 "	F	5	3	2	60%	
	M	2	2	0	100%	60%
41 – 50 "	F	–	–	–	–	
	M	3	1	2	33%	
51 – 60 "	F	1	1	0	100%	
	M	1	0	1	0%	
61 – 70 "	F	–	–	–	–	75%
	M	1	1	0	100%	
71 upwards.	F	–	–	–	–	
	M	1	1	–	100%	

It will be observed that the mortality rises steadily at the greater ages, being 15·3% for the first 30 years:

60% from 30 to 50 years

and 75% over the age of 50.

The next point is the length of time elapsing between the perforation and the operation - and here we are at once met by a difficulty: because, while all these cases are acute perforations, one cannot fail to recognise varying degrees of acuteness: it seems probable, indeed, that the acute perforations merge gradually into the class known as "chronic perforations" or "gastric leaks". Thus, I have known a case sent into hospital with a large perigastric abscess a fortnight after the ulcer had perforated - obviously a case of "gastric leakage": this series presents on the one hand, a case recovering though 50 hours had elapsed since perforation: and on the other hand two cases dying though only 6 hours had elapsed - surely, varying degrees of acuteness. It is often stated that the condition of the gastric contents is of great moment in deciding the fate of a given case - unfortunately I cannot give any data on this point; but I do not believe that it would explain the difference between the cases just quoted. Probably the degree of acuteness depends more on the size of the perforation than on any other point - but this is a statement not lending itself to absolute proof.

To return to the duration of the perforation – I find that the average duration of the fatal cases was 19·4 hours: and that of the successful cases 16 hours. The mortality at different periods after perforation will be best indicated by a table – and in the last column I give the mortality quoted by Robson and Moynihan from their 123 cases.

	Cases.	Recov.	Died.	Mortality.	Robson & Moynihan.
Less than 12 hrs.	12	9	3	25·%	23·5%
12 to 24 hrs.	12	7	5	41·6%	63·6%
24 to 36 hrs.	3	2	1	33·3%	87·5%
36 to 48 hrs.	1	–	1	100%	100%
over 48 hrs.	2	1	1	50%	51·5%

As I remarked before, the lower mortality after 48 hours is easily explained by the more chronic nature of the perforation. But both these series of figures show the enormous importance of early diagnosis and operation in these cases.

All statistics agree that no operator can save more than about half his cases of perforated gastric ulcer: the actual mortality of this series is 36·6%: Robson and Moynihan's figures give 55%; and Sargent had a mortality of 42%, but his cases showed a very high average of time between perforation and operation.

Other points in connection with the prognosis are

suggested by these cases:-

Thus, the average pulse rate of those who recovered was 113, and that of those who died was 128 - only two cases showed a pulse-rate of under 100, and both recovered: one patient recovered with a pulse-rate of 140 and another with one of 130 - So, the pulse-rate must not be relied upon very confidently for prognosis: unless indeed it is higher than 140 when the prognosis is bad (2 fatal cases with rates of 135 and 168 respectively.)

It is of much moment to notice the respiration-rate: unfortunately I have not got the figures for all the cases, but among 10 of the successful cases not one was breathing faster than 30 per minute: while among 7 of the fatal cases not one was breathing as slowly as this.

The temperature appears to afford no indication, except in those cases where it is subnormal: only 3 out of 18 cases had subnormal temperatures, and all died.

Of course no hospital cases can give one any very adequate idea on the frequency and fatality of this catastrophe, for a very limited acquaintance is enough to satisfy one that there are very many of the more acute cases which are diagnosed and allowed to die without any attempt being made to save them:- this is necessarily so, as in some individual cases I know of: but surely these unfortunate cases will become fewer as the means of speedy surgical assistance are coming more widespread and more

easily obtained. It is commonly stated that some patients perish from the first intense shock which follows immediately on perforation - how common this is cannot very easily be ascertained; but I have enquired among many medical men and have never heard of any single case, so I conclude that it is fortunately rare.
The frequency of perforation in proportion to the number of gastric ulcer cases is variously stated as being from 6.5% to 23.5%: it is interesting to note that Pariser and Linduer state that out of 200 cases of gastric ulcer, 190 will be posterior and that 4 of these will perforate; while only 10 will be anterior, with 8½ cases of perforation.

Another interesting statement is made by Lebert to the effect that 6½% of ulcer cases die of perforation, while 3½% die of haemorrhage.

Before detailing the pathological findings in these cases, I wish to refer to another subject - the Sequelae of the disease. The operating Surgeon can never afford to forget the possibility of acute inflammatory diseases of the chest; and all Surgeons know that this danger is especially great where there has been any septic process in the upper part of the abdomen - but I venture to think that few surgeons realise the gravity of this danger.

This series of cases presents a most pointed warning.

In the 11 fatal cases, the abdominal condition was entirely responsible for 6 deaths: one other case showed congenital cystic kidneys at the autopsy, one acute pleurisy and 3 showed acute broncho-pneumonia – That is to say that the chest condition was one cause of death in 4 out of 11 cases. But it is the successful cases that most clearly illustrate the danger – for of these 19 patients, 4 suffered from Pneumonia, 2 from Empyema, and 1 from Pleurisy with Effusion. This gives a total of 7 cases of acute inflammatory diseases of the chest among the 19 successful cases (or 36·7%). Adding the successful and the fatal cases together, we find that 11 (or36·6%) of the patients were so affected.

In addition to these conditions, the Surgeon had to contend with yet other dangers: the case of congenital cystic disease of the kidneys has been mentioned; one patient developed an acute Volvulus and required a second operation to save his life; a third was far advanced in pulmonary phthisis, but survived both his abdominal condition and an acute pnuemonia which supervened. One patient has appeared twice in this series: she developed two perforations with one year's interval between them, and recovered from both. A case of great interest has been included among the successful cases, because she did recover from the perforation, though she ultimately died

from the effects of it: her convalescence from the abdominal condition was marred by the development of an Empyema: she recovered from this sufficiently to leave hospital, but died 3 months from the time of the perforation of a cerebral abscess:-

It should be added that these pulmonary complications developed in spite of the utmost precaution - the patients were anaesthetised with chloroform; and were propped up in bed at the earliest possible moment.

Finney has stated that in 20% of these cases, there are two perforations to be found. In the present series, I find that the double lesion was discovered once in the operating theatre - in this case, there was a perforated duodenal ulcer as well as the gastric one: in one other case it was found at the autopsy, an anterior perforation having been closed and a posterior one overlooked. This gives a percentage of 6.6 for the double lesion.

It is not very easy to classify the positions of the perforations: but the following is the nearest I can get to absolute accuracy:-

Of the 31 perforations in the stomach, 27 were anterior (or 87%). Figures corresponding almost exactly with those drawn from Jacobsen's 97 cases.
These may be divided as follows:-

In the pyloric third 11

In the cardiac third 8

In the middle third 8

The remaining 4 perforations were on the posterior aspect, 3 being in the pyloric third, and one in the central third of the organ.

In 20 of the perforations, it is to be noted that the lesion was either on, or close to, one or other of the gastric curvatures - in 18 cases this was the lesser curvature, only 2 perforations being close to the more accessible greater curvature. In seven cases it is noted that the lesion was midway between the curvatures.

Finally, I would allude to two details of the treatment of these cases:- The abdominal cavity was in every case flushed out carefully with warm normal Saline Solution, and was always drained by tubes thrust through a suprapubic incision down into the Pouch of Douglas.

And in one of the successful cases, the Surgeon

had resort to a most ingenious method of closing a perforation that was too inaccessible for the usual method of Suturing – by thrusting a rubber tube into the orifice in the stomach, and suturing it there as in a Gastrostomy by the method of Witzel.

IV Bacteriology.

A. In Malignant Cases.

In 15 of these cases cultures were taken from the gastric and jejunal contents, by the method already described; making in all 30 tubes inoculated. Of these, 9 showed no growth of organisms: in 3 cases there was no growth on either of the tubes; in 2, the jejunal, and in 1 the gastric culture was sterile. In the remaining cases a growth was obtained in both tubes. So that organisms were obtained from 11 stomachs and from the jejunum in 10 cases. The organisms found on the media will be best recorded in tabulated form.

	In Stomach.	In Jejunum.
Streptococci.	0	1
Staphylococci.	2	1
Pneumococci.	2	0
B. Lactis Aerogenes.	2	2
B. Acidi Lactici.	2	0
Sarcinae.	3	0
B. Coli.	3	4
Proteus Vulgaris.	1	1
Diphtheroid Bacilli.	0	1

B. In Simple Cases.

First these may be given as a whole, and then considered under the various headings used before.

In all, cultures were taken from 65 of these cases. It is astonishing to find that in 41 cases (or 63%) there was no growth on either tube. In another 8 cases the jejunal and 8 the gastric culture gave no growth. That is to say that 75·3% of the gastric and 75·3% of the jejunal cultures were sterile. This is in most marked contrast to what obtains in the malignant cases, where only 26·6% of the gastric and 33·3% of the jejunal cultures failed to grow organisms. The most obvious explanation lies in the comparative quantity of free Hydrochloric Acid in the two varieties of case. For it is generally recognised that this is a most potent antiseptic in the normal stomach; and it has been shown already that the malignant cases are characterised by the reduction or absence of the free Acid.

In detailing the routine of methods, I mentioned that all these patients were prepared for operation by gastric lavage among other things, and that diluted Condy's fluid was used for this purpose. I think it is probable that this process removes many of the micro organisms, but I cannot believe that it alone is responsible for the large number of negative results obtained; for the

fluid is too weak to destroy the organisms, it was not used with sufficient force or for long enough time to remove all the organisms mechanically – in fact it was used to remove gross dirt and not to render the mucosa "Surgically clean".

The number of sterile jejunal cultures is also higher than one would naturally expect at first sight; but one must remember that the contents of the first few inches of the jejunum have just escaped from the stomach and met the antiseptic action of the bile. This series of observations would imply that the free Hydrochloric Acid is much the stronger antiseptic of the two (partly, no doubt, because it acts for a longer time) since the malignant cases show a far higher percentage of successful ~~cases~~ Inoculations than do the simple.

To detail the results of these investigations as they apply to the various types of simple cases, I shall employ a table:-

	Sten-osis.	Scars.	Adhe-sions.	Dilata-tions.	Hour Glass.	Total.
No growth in either.	23=74%	12=52%	1=33%	3=50%	2=100%	41=63%
No growth in Gastric.	3=9%	3=13%	0	2=33%	0	8=12%
No growth in Jejunal.	3=9%	4=17%	1=33%	0	0	8=12%
Growth in Both.	2=6%	4=17%	1=33%	1=16%	0	8=12%
	31	23	3	6	2	65

This table is intended to show the way in which the negative and positive results were divided among the

varieties of simple lesion. It will be seen that there are few great variations from the mean.

The following table is intended to record the number of times the various organisms were found on the media, and their distribution among the varieties of simple lesion. In each column, the figure given first shows the number of times the organism was found in the gastric cultures, and that given second the number of times in the jejunal:-

Organisms.	Stenosis.	Scars.	Adhe-sions.	Dilata-tion.	Total.
Streptococci.	-	-	1:-	-	1:-
Staphylococci.	1:1	-	-	-	1:1
Pneumococci.	-:1	1:1	1:-	-:1	2:3
B.Lactis Aerogenes. B.Acidi Lactici.	-	-	-	2:1	2:1
Sarcinae.	4:3	6:3	2:1	-	12:7
B. Coli.	-:1	-	-	-	1:1
Yeasts.	-	-:1	-	1:-	1:1
Other Organisms.	-:2	1:1	-	-	3:1
					23:15

From this it appears that more varieties of organism are found in the stomach than in the jejunum; but that far the most common are the various forms of Sarcinae. The frequency of the pneumococcus compared with the Streptococci and Staphylococci is rather unexpected, though it is easy

to see how all three organisms gain entrance to the stomach, when we remember that all these organisms are very often present in the mouth.

C. In Unknown Cases.

In addition to these inoculations, I have the Pathologist's report on another series taken by the same surgeon by the same methods. Unfortunately they are from cases not included in this review, and whose nature I cannot ascertain. Cultures were taken from both stomach and jejunum in 17 cases, and from the stomach only in 6. This makes a total of 40 inoculations taken, Of the gastric tubes 11 showed no growth, and of the jejunal 8.

No growth in Either.	7 = 41%
No growth in Gastric.	4 = 17%
No growth in Jejunal.	1 = 5%
Growth in Both.	8 = 47%

The frequency of the organisms found was as follows:-

	Gastric.	Jejunal.
Streptococci.	1	-
Staphylococci.	3	2
Pneumococci.	3	-
Sarcinae.	8	1
B. Coli.	1	5
Yeasts.	3	1

This shows a much smaller variety than either of the preceding groups of cases:- Yet the cases from which these data are drawn must necessarily belong to one of the groups already given.

For purposes of comparison, I shall tabulate the data of these groups together.

I The frequency of sterile inoculations.

	Malignant.		Simple.		Unknown.		Total.	
No growth in Either.	20%		63%		41%		52%	
No growth in Gastric.	7%	40%	12%	87%	17%	63%	12%	75%
No growth in Jejunal.	13%		12%		5%		11%	
Growth in Both.	60%		12%		47%		25%	

We thus find that no growth was obtained just as commonly from the stomach as from the jejunum; and that in only 25% of cases was a growth obtained from both organs.

II The comparative frequency with which the various organisms were found in the cultures. To simplify the table, I have included under "other organisms" five which were found on a very few occasions each: they are Proteus Vulgaris, Micrococcus Luteus, Diphtheroid Bacilli, Leptothrix, and Long Bacilli which were not identified by the Pathologist. The double set of figures has the same significance as before - those first given refer to the stomach, those second refer to the jejunum.

	Malignant.	Simple.	Unknown.	Total.
Streptococci.	-:1	1:-	1:-	2:1
Staphylococci.	2:1	1:1	3:2	6:4
Pneumococci.	2:-	2:3	3:-	7:3
B.Lactis Aerogenes.	2:2	1:1	-	3:3
B. Acidi Lactici.	2:0	1:-	-	3:-
Sarcinae.	3:-	12:7	8:1	23:8
B. Coli.	3:4	-:1	1:5	4:10
Yeasts.	-	1:1	3:1	4:2
Other Organisms.	1:2	3:4	1:1	5:7
Total Cases.	15	65	23:17	103:97

Total Gastric Inoculations = 103.

Total Jejunal Inoculations = 97

This shows that Sarcinae are much more frequently found than any other organisms, especially in the gastric cultures. Riegel and Oppler have both stated that Sarcinae are rarely found in Gastric Carcinomea. Here they were found in 20% of the cases, as compared with 18·4% of the Simple cases. The Bacillus Coli is the commonest of the jejunal bacteria, as one might expect; and yet this organism is not found normally so high up in the alimentary tract. Turck of Chicago has endeavoured to establish the Bacillus Coli as the cause of gastric ulcers, and states that this bacillus when ~~denoid~~ DERIVED from a human being and placed in a dog's food will cause a gastric ulcer in the dog: it is remarkable that not one of our

Simple cases showed the presence of this organism though nearly all of them were the result of ulcers - though, of course, it is conceivable that the bacilli may have caused the lesion and disappeared before the time of the operation.

I have already referred to one factor which probably reduces the number of bacteria found in these cases - I mean the gastric lavage. It is only just to state on the authority of Herter that there are most organisms found in the jejunum when there is most food in it: the part of the jejunum opened at the operations was invariably empty, as one would wish and expect after the preparations for operation: so that it is probable that the jejunal data are vitiated by the 12 hours' starvation which preceded operation.

D. Perforated Gastric Ulcer.

Here the most important results are those derived from inoculating agar slopes from the free fluid of the peritoneum: this was done as soon as the abdomen was opened, and the inoculation was taken from the neighbourhood of the gastric perforation. This method was pursued on 10 occasions: four of the cases ended fatally and 6 recovered. In 3 cases the media showed no bacterial growth, and 2 of these cases ended fatally.
The organisms found were as follows:-

	Fatal Cases.	Succesful Cases.
No growth.	2	1
Streptococci.	2	1
Pneumococci.	1	-
Yeasts.	0	3
B. Coli.	0	2
Diphteroid Bacilli.	1	1

In both the fatal cases it will be observed that the peritoneal infection was a mixed Streptococcal one: in one case with pneumococci and here the cause of death was general peritonitis, and in the other case with diphtheroid bacilli. In the one succesful case where the Streptococci were cultivated, no other organism was found with it.

The fact that half the fatal cases gave no growth on the agar is difficult to understand. One can only account for it by supposing that anaerobic organisms were present, which failed to grow under the conditions supplied to them.

It will be rembered that the pneumococcus was discovered in 7 of the gastric cultures or 7% - it is here found in one peritoneal culture out of 10 - almost the same percentage. But I have already pointed out that no less than 36.6% of all the perforation cases suffered from acute inflammatory conditions of the chest after operation, and one at least of these conditions was pneumococcal in origin: As the pneumococcus is the most frequent cause of these chest affections, one is faced with the fact that (1) either it was not pneumococcal in these particular cases or (2) that there were pneumococci lying in the respiratory organs which assumed pathogenic activity directly the ulcer perforated. That is to say that this series of cases is not compatible with the teaching that the chest affection follows on the abdominal by lymphatic spread through the diaphragm unless we assume that these cases of pneumonia, etc. were due to organisms other than the pneumococcus.

The presence of the Colon Bacilli was established in 2 cases, both of which ended successfully. They were found in the Stomach in one of these cases: so that in

only 1 case can we assume that they found their way through the intestinal wall after general peritonitis had reduced the vitality of the bowel - in this case the perforations had existed for 17½ hours, and the assumption seems fully justified. Indeed, we might reasonably have expected to find the bacillus in more than 10% of the cases, when it is remembered that the average duration of the perforation was 17 hours.

In addition to the Peritoneal Cultures, inoculations were taken from the stomach in 5 cases. Only 1 of these failed to give a positive result - a far smaller proportion of sterile tubes than was obtained in the chronic non-malignant cases - and this one case ended fatally. Streptococci were found twice, Staphylococci once: Bacillus Coli once, and Yeasts once. It will be observed that Streptococci were found in the stomach as often in these 5 perforation cases as in the 103 cultures taken from less active forms of gastric disease. Of course the number of cases is far too small to justify any general statement: but these data do show that streptococci are present more often in the active than in the chronic disorders, and they at least suggest that the Streptococci may be responsible for the activity shown by the ulcer, if not for the origin of the ulcer. It will be of the utmost interest to compare these data with future observations and to note whether this important organism is